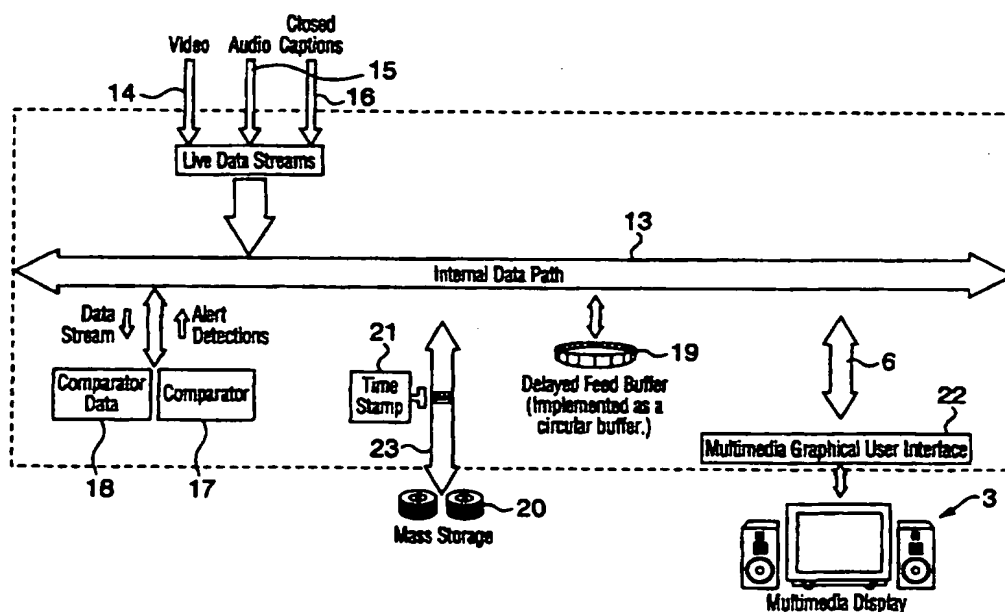




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 17/30, 11/32, H04H 9/00, H04N 7/088, G06F 17/60, G11B 27/034	A1	(11) International Publication Number: WO 96/27840 (43) International Publication Date: 12 September 1996 (12.09.96)
(21) International Application Number: PCT/CA96/00131 (22) International Filing Date: 4 March 1996 (04.03.96) (30) Priority Data: 9504376.6 4 March 1995 (04.03.95) GB (71) Applicant (for all designated States except US): TELE- VITESSE SYSTEMS INC. [CA/CA]; 603 March Road, Kanata, Ontario K2K 2M5 (CA). (72) Inventors; and (75) Inventors/Applicants (for US only): MENARD, Robert [CA/CA]; 168 Oakridge Boulevard, Nepean, Ontario K2G 2V2 (CA). MACLEAN, Roger [CA/CA]; 90 St. Claire Avenue, Nepean, Ontario K2G 2A6 (CA). STREATCH, Paul [CA/CA]; P.O. Box 1196, Richmond, Ontario K0A 2Z0 (CA). (74) Agent: MITCHELL, Richard, J.; Marks & Clerk, P.O. Box 957, Station B, Ottawa, Ontario K1P 5S7 (CA).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: AUTOMATIC BROADCAST MONITORING SYSTEM



(57) Abstract

A system for monitoring standard broadcast signals, comprises a device for receiving the broadcast signals, a user-operable selection device for inputting criteria identifying program content of interest to the user, a database for storing data representing the criteria, and a recognition device for generating from the broadcast signals a program data stream representative of the program content. A comparator compares the program data with the stored data, and an output device carries out a predetermined action, such as recording a segment of the program, when the program data matches the stored data. The system will, for example, activate a window on a multimedia PC when preselected program material is present in the broadcast signals.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LJ	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

- 1 -

AUTOMATIC BROADCAST MONITORING SYSTEM

This invention relates to a system for automatically monitoring broadcasts, such as television broadcasts, and detecting content of particular interest to individual viewers.

Many organizations, for example, stock brokerage services, have an on-going need to monitor world events. It is known for such organizations to retain media and news scanning services that employ people to watch television to look for particular topics of interest. These services log occurrences of particular items and either advise their customers by telephone or provide reports that may include video clips that they manually put together. For example, the service might continuously record a particular television channel while someone watches it. The person watching will record in a log the occurrences of interest, noting the time and tape position. The recorded tapes will later be searched using the time or tape position from the logs. Edited clips are then put together in a time consuming manual process.

The shortcomings with this method are many. The response time in noticing an event of interest is slow, typically minutes. Many hours may pass before the interested party is informed of the event. The cost of paying people to watch television is high. For example, at \$10 per hour, twelve hours per day, the cost works out at \$43,800 per channel per year. Looking up individual video clips is very slow and requires knowledgeable staff because the look-up is keyed to time of occurrence rather than words or phrases. Typical tape fast forwards or rewinds take three to five minutes each. The approach is also inflexible in that any new search on recorded video requires people to

watch it all over again, thus incurring the entire overhead again.

Other solutions include raw television capture devices for computers. These capture devices convert the television video to digital format for storage and distribution on computer networks. These products capture the raw footage, but are not in any way dependent on content. They may capture and distribute video, and/or audio, and/or caption text, but they do not alert users to particular topics immediately as they occur on television broadcasts.

Another solution uses a technique called datacasting. With this technique, the broadcaster injects data into the vertical blanking interval (VBI) of the video television a signal that contains information about the program. The data is created by the broadcaster, or source program author. The data usually contains titles, summaries, and other information related to the program. This information can be used by the user to select items of interest. The disadvantage to this approach is that it requires special information to be created at the source and transmitted from the source. It also requires special proprietary hardware to receive the data, and more significantly still requires the user to continually monitor the datacast information. This VBI data injection approach has another major shortcoming in that very few, if any broadcast stations use this technique, and those that do encode it so that special equipment is required to decode it. CNN at Work, sold by Intel is an example of such a product.

An object of the invention is to alleviate the aforementioned disadvantage of the prior art.

SUMMARY OF THE INVENTION

According to the present invention there is provided a system for monitoring broadcast signals, comprising: means

for receiving the broadcast signals and generating program signals to make available programs carried by said broadcast signals; user-operable selection means for inputting criteria identifying program content of interest to a user; a database for storing data representing said criteria; recognition means for generating from said broadcast signals a program data stream separate from said program signals and representative of program content; a comparator for comparing said program data stream with said stored data; and an output device operable to carry out a predetermined action when said program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The broadcast signals can be any type of signals carrying programs and distributed over a suitable transmission medium, wireless, cable or satellite. In one embodiment, the broadcast signals are television signals (although radio signals can in some cases be used if they are accompanied by program data, as is sometimes the case). They may also be television signals distributed digitally, for example, using the MPEG format.

In the case of television signals, the recognition means can monitor the closed caption text normally transmitted with the signals. Upon detection of certain words or phrases, the system generates an alarm condition to alert the user to the presence of such program content. For instance, in the case of a standard television set, a simple system could just turn up the volume so as to allow the user to hear the audio. In a more sophisticated system, the signals are stored and tagged for subsequent retrieval using database searching techniques.

The predetermined action can be any form of action that permits the user to examine the portion of the program of

interest. For example, it can involve recording the program signals and data signals for later review, activating a video window in a computer, or just activating a beeper to alert the user to the broadcast of program content of interest. For example, a message could be sent to a beeper advising the user that "Clinton is on television now", thus enabling him to watch the program on the nearest television set.

In another embodiment voice or pattern recognition techniques can be employed to monitor the audio or video directly.

Thus, with the system according to the invention, users can be automatically alerted to events as they happen. Video, audio and closed captions from television broadcasts can be automatically indexed and stored so they can be retrieved later in whole or in part, using *ad hoc* queries. Users can retrieve individual clips of video, audio or closed caption text by specifying content, for example by searching for a key word or phrase in addition to the traditional time/position based queries.

The invention is thus capable of automatic detection of content in television broadcasts using computers, synchronizing and capturing the incoming closed captioned text together with the video and audio in a computer environment, and indexing and retrieval of individual sections of video and audio based on the content of, for example, closed caption text.

The invention is applicable to the field of multimedia applications generally. It provides techniques for automatically creating indexed multimedia databases and has many applications. For example, government elected representatives and their assistants can monitor television programs to determine what is being said about them, about

their policies, etc. They can be alerted to issues immediately.

Regulated or government organizations can use this invention to monitor television programs for negative (or positive) views on their organizations. They can know about problems reported in the media and react sooner. They can track the media reaction to their policies.

Marketing departments can use this invention to collect information on competitors, customers of the organizations that employ them. They can be alerted to issues immediately. As well, marketing multimedia databases can be built automatically.

Broadcast industry, cable carriers and telephone companies can use this system to create and maintain multimedia databases. Cable Companies and Telco's can use this invention to provide differentiated services to their customers, for example filtering and querying capability on live broadcasts and also on multimedia databases.

Individuals can use this technology to minimize time spent watching television. Items not of interest can be filtered out. Program transcripts can be captured and perused with only the desired video and audio being played back.

The invention also provides other multimedia applications and databases with access to fully indexed video, audio and closed captions from broadcast television.

The invention also provides a multimedia computer system, comprising: a central processing unit; a video capture unit for receiving broadcast television signals and generating a video signal therefrom; a video display unit capable of displaying said video signals under program control; means for decoding data signals embedded in said

television signals and generating a program data stream representative of program content of said television signals; means for inputting criteria identifying program content of interest to a user; and a database for storing data representing said criteria. The central processing unit is programmed to continually compare the program data with said stored data and carry out a predetermined action when said program data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The invention still further provides a method of monitoring broadcast signals, comprising the steps of: extracting program signals from said broadcast signals; generating from the broadcast signals a program data stream separate from said program signals and representative of program content; comparing said program data stream with stored data identifying program content of interest to the user; and generating an output condition when said generated program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

The invention additionally provides a computer-readable storage medium having binary information encoded thereon, said binary information being operable when interpreted by a computer to direct the computer to monitor broadcast signals and generate program signals to permit the presentation of program material carried by the broadcast signals to a user, analyze incoming broadcast signals to generate a program data stream separate from said program signals and representative of their program content, compare said data stream with stored data identifying program content of interest, and generate an output condition when said generated data matches said stored data to permit the user

to examine a portion of a monitored program associated with said matching program data stream.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a block diagram of a system in accordance with the invention showing the overall system architecture;

Figure 2 is a block diagram showing the internal architecture of the system shown in Figure 1;

Figure 3 is a flow chart showing the closed caption stream processing;

Figure 4 is a flow chart showing audio stream processing;

Figure 5 is a flow chart showing video stream processing;

Figure 6 is a flow chart showing the alert handling procedure; and

Figure 7 is a flow chart showing the stored data processing;

Figure 8 is an embodiment of the invention based on a standard stand-alone multimedia personal computer;

Figure 9 is a functional block diagram of a live feed arrangement for the embodiment shown in Figure 8;

Figure 10 is a functional block diagram of a network feed arrangement;

Figure 11 is a functional block diagram of an arrangement for playing back or re-recording a video segment;

Figure 12 shows a typical display screen;

Figure 13 shows a typical display screen showing a program listing; and

Figure 14 is a block diagram of another embodiment of the invention applicable to an on-demand architecture.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figure 1, a monitoring system 1 in accordance with the invention receives a standard broadcast television signal from a tuner 2. The system is connected over a bi-directional link 6 to a multimedia display 3 consisting of a personal computer including a CRT monitor 4 and speakers 5. The multimedia display can form part of a conventional multimedia PC set-up. The system 1 can also be connected to a network 7, which in turn is connected to individual workstations 8.

The monitoring system 1 comprises a video capture unit 9, a closed caption capture unit 10, and an audio capture unit 11. Such units are *per se* commercially available. Data streams 14, 15, 16, which are preferably digital although they could be analogue, from these units are passed to bus 13 of unit 12, shown in more detail in Figure 2. Unit 12 carries out several functions as follows:

- Video, audio and closed Caption data streams are synchronized and tagged for time of arrival.
- Users are alerted to program content by continuous checking of the closed caption text stream.
- Video, audio and closed captions are saved to disk storage. The video and audio clips can be retrieved by word or phrase using the closed captioned text and the synchronizing tags that index the video and audio. The Video, audio and closed caption text might be saved to disk continuously but the recording of the data can also be based on content.

For example, the system might be instructed to start recording video, audio and closed caption data from 30 seconds before (using a delayed feed buffer) to 5 minutes after the appearance of a keyword in the closed caption stream. This is significant since continuous storage of video data imposes huge storage requirements.

- Clients on the network 7 can receive alerts, multimedia feeds and perform queries as shown on the multimedia display above.

In operation, the user enters data either through, for example, a LAN-connected PC 8 or the workstation 3. For example, the user might enter a series of key words representing topics of interest. These key words are then entered into a profile database in mass storage device 20 along with the identity of the user. When the selected key words appear in the closed caption data stream, the system generates an alert signal to alert the user. For example, the system might be set to trigger an alert if the words CLINTON and YELTSIN occur within an adjacent stream of twenty words. In a simple case, the alert may, for example, involve turning up the sound on the monitor 4. If desired, the system can also employ fuzzy logic principles to find similar words, for example, synonyms of the words entered by the user. This arrangement also copes with mis-spellings, which are quite common in closed caption systems.

Each user connected to the system can of course enter his or her own customized search profile.

Referring now to Figure 2, when the system is monitoring the broadcast signals, the incoming data streams 14, 15, 16 are passed over internal bus 13 to comparator 17, which compares the data with comparison data stored in a profile database 18 set-up by the user in mass storage unit

20. Database 18 stores the data entered by the user through the multimedia PC 3. For example, the user may have chosen a set of keywords and phrases to look for in the closed caption data stream. These are entered through multimedia PC 3 and stored in the database 18.

The incoming data streams, or as noted above selected portions of them, are stored in mass storage device 20 along with a time stamp added by time stamp unit 21. Storage device 18 may be analogue, although it is preferably digital to allow random access to the information.

Through PC 3, the user can also set up other actions for the system to perform when a keyword or phrase is found. These actions include sounding a beep, activating a remote beeper, opening a video window, sending electronic mail - essentially any action the computer can be programmed to perform. Also the system can automatically create a profile, (or comparator database), from an existing database, spreadsheet or word processor file, that can be used for monitoring. The system creates this profile by searching the specified files for proper nouns, categories and pre-defined keywords. After retrieving these from the specified file, they are presented to the user for modification.

Each user 8 on the network can also add, delete, and modify the database profile 18 over the network 7 to customize it for his individual requirements.

When system is storing data, the closed captioned text is stored in a standard text database in the mass storage unit 20. There are at least two columns in the database, namely the captured phrase and the absolute time it was captured. The audio stream and video streams are also captured together with their absolute start time. Individual sections of video and audio can be retrieved using SQL-like queries on the closed captioned text. The associated video

- 11 -

and audio are retrieved using absolute time returned from the text query. The system will position to the exact time within the video and audio that the word or phrase occurs at.

The system also has a delayed feed buffer 19, implemented as a circular buffer. This stores that last n minutes of each of the data streams. The user can specify the length of this buffer and each of the three data streams can have different lengths. This buffer 19 also provides the user with the ability to backup a few seconds or minutes when an alert is received. Using technology known *per se*, the delayed feed buffer can also be played back at double speed so that the user can catch up to the live broadcast.

The system provides the ability to distribute video, audio and text in whole or in part. Lower speed systems may choose only to receive the closed captioned text of a program, or just the audio.

A specific example of the use of the monitoring system is as follows: A television viewer wants to watch the movie "Gone With The Wind". The viewer sets the computer to beep when the words "I don't give a damn" are spoken. Alternatively, having stored the same movie with this technology, they could position directly to the scene where those words are spoken, without having to know where in the movie, by time or relative position, these words occur. The user interface for positioning to the words or phrases of interest is very similar to a word or phrase search in a word processor, or an SQL query.

The system in the embodiment described monitors the incoming closed captioned text stream, synchronizes it with the incoming video and audio, and alerts the user to topics of interest. When an alert happens, programmable actions, such as sounding a beep and/or bringing up a video window,

occur. The incoming video, audio and closed caption text are stored with time based tags and indexes, creating a fully indexed multimedia database automatically.

Users have an SQL-like query capability on closed caption text with an ability to retrieve associated portions of video and audio. They can configure the monitoring software for particular words, phrases or general content, and perform particular actions upon alerts.

The video, audio and closed captioned text can be distributed on the computer network 7, either directly or through electronic mail. The system and network managers can be provided with an ability to manage the system and network resource usage.

Figure 3 shows the processing of the embedded data stream, which in this embodiment constitutes the closed caption stream. The text is first acquired in unit 110 and after insertion of a time-stamp in unit 111 inserted into the delayed feed buffer 19, after which is compared to comparator 113 for comparison with words from the user profile stored in storage unit 20. If a match is found, decision unit 114 activates alert handling unit 115 (shown in more detail in Figure 6).

In the absence of a match, decision unit 116 determines whether the closed caption text is to be recorded in accordance with user instructions. If yes, the closed caption text is written to file in unit 117; if not, unit 118 determined whether the text is to be displayed in closed caption display 119.

Figure 4 is a flow chart similar to Figure 3 for pattern matching based on audio, which is treated separately from the video. Audio units 210 to 219 operate in a similar manner to units 110 to 119 in Figure 3 except for the fact

that the pattern matching is achieved by extracting text from the audio stream using voice recognition techniques.

Figure 5 is a flow chart similar to Figure 3 for pattern matching based on video, which is treated separately from the audio. Video units 310 to 319 operate in a similar manner to units 110 to 119 in Figure 3 except for the fact that the pattern matching is achieved by extracting text from the video stream using pattern recognition techniques or by analyzing color histograms, for example.

Figure 6 shows how alerts are handled. When an alert occurs as a result of a pattern match, unit 410 identifies the alert type. If an audible alert has been requested, decision unit 411 sounds bell 412.

Decision unit 413 determines whether a recording has been requested, and if so causes unit 414 to write video, audio, and closed caption data from delayed feed buffer 19 to be written to a file on mass storage unit 20. Unit 415 causes the recording of incoming video, audio, and closed caption data to be commenced.

Decision unit 416 determines whether a display has been requested, and if so unit 417 causes unit 418 to start displaying the video, audio and closed caption data.

Figure 7 illustrates the stored data handling. One or more keywords are first requested from the user by unit 510. The user enters the keywords through the computer keyboard.

Unit 511 searches the closed caption file for matching keywords and unit 512 displays a list of matching segments. Unit 513 requests a user selection. Decision unit 514 returns control to the request unit 510 if no selection is made; otherwise unit 515 locates the matching segment, which is then displayed by unit 516.

A system in accordance with the invention can conveniently be implemented as a stand-alone system on a personal computer running a Windows™ operating system as shown in Figure 8. Personal computer 30 includes at least a 486 DX66 and preferably a 90MHz Pentium or higher microprocessor 31 on the motherboard and a hard drive 32 with preferably at least one gigabyte of storage space connected to PC bus 35. A Creative Labs Video Blaster™ video capture card 33 is located in one of the expansion slots of the motherboard. A suitable 16-bit sound card 34, such as a Soundblaster™, is located in a second expansion slot. The personal computer 30 is connected to a conventional video display unit 28 and keyboard 29.

The video card 33 and sound card 34 send respective compressed video packets 35 and audio packets 36 to the PC bus 35.

Incoming rf television signals 37 from a cable or antenna source 38 are fed to a cable converter or VCR which demodulates the incoming rf signals and generates an audio stream 40, which is fed to the sound card 34, and a video stream 41, which is fed to the video card 33.

The video signals 41 are also fed to a Sunbelt TextGrabber™ closed caption decoder 42. This decodes the closed caption signals embedded in the vertical blanking interval and sends an ASCII text stream to the PC bus 35 through the serial port 44 and UART 45, which created text packets 46.

The user enters instructions through the keyboard 29 with the assistance of dialog boxes and a mouse (not shown) in a customary manner.

Figure 9 shows in more detail the processing of the signals in the personal computer 30. The video signals are

passed through rate controller 50, which measures the frame rate in accordance with user instructions, to video delay unit 51. The audio signals are passed directly from audio capture unit 34 to audio delay unit 52. The closed caption signals are passed through closed caption pattern matching unit 53, which looks for pattern matches with the stored data representing the selected criteria, and closed caption display unit 54 to closed caption delay unit 55. Caption pattern unit 53 can carry out pattern matches on the basis of Boolean combinations of keywords entered by the user through the keyboard 29. For example, the pattern matching circuit 53 might trigger an event if two selected words occur within a stream of twenty adjacent words. The closed caption display unit 54 permits the user to view the closed caption text directly in a window on the video display unit 28 under program control.

The delay units 51, 52, 55 serve as buffers that hold the respective incoming signals for a time that can be selected by the user, for example 10 seconds or 20 seconds. This allows the user to either replay a portion of program material that has just been broadcast or to arrange for the computer to store not only a predefined segment of program material after detection of a pattern match, but also a segment prior to finding a match. For example, a typical set-up may be to store the previous ten seconds and the following twenty seconds after a pattern match. Each delay unit 51, 52, 55 has three output ports a, b, c.

The video delay unit 51, audio delay unit 52, and closed caption delay unit 55 are connected through port b to a network interface 56 for the distribution of captured material over a network, such as a local area network.

The above units are also each connected through port c to a synchronizing unit 57, an audio synchronizing unit 58

and a closed caption synchronizing unit 59. These three units 57, 58, 59 create an AVI (Audio-Video interleaved) file 60 on hard disk 32, which contains a video clip consisting of video, audio and associated closed caption data.

The units 51, 52, and 55 are also connected through port a to additional synchronizing units 61, 62, 63 connected respectively to a video display generator 64, a sound generator 65 in audio card 34, and a closed caption display generator 66. The video and closed captioning thus appear in a window, with the video (and audio) synchronized to the closed captioning.

When a pattern match is detected by the unit 53, a signal 68 is sent to the record callback unit 67. This causes one or more of several predetermined actions to take place depending on the mode selected by the user. The record callback unit activates ports a, b or c of delay units 51, 52, 55 to cause the delayed feed to be sent to the live display through units 61, 62, 63, the network 56, or the AVI file 60 through units 57, 58, 59. Instead of being stored in a computer file, the video and audio (and possibly closed caption stream) could be stored on a VCR tape. The ports can access the buffered signals at any time point in the buffers depending on the user setting.

Figure 10 shows an arrangement where the computer receives a feed from a local area network (LAN). In this case the incoming broadcast signals are received by a network server, digitized and transmitted to the clients on the network. The network provides signals equivalent to the capture units 33, 34, 42. The rest of the system remains the same. In this embodiment, only the server requires a video card and closed caption capture unit. The clients receive

the digitized signals, including video, sound, and closed captions over a network interface, such as SMC EtherEZ.

In Figure 11, an AVI file is received by unit 90 and the audio extracted in unit 95. The video is sent through video synchronizer 91, rate monitor 92 and video splitter 93 to video display 94 and output AVI file 97. The closed caption stream is sent through closed caption synchronizer 100, closed caption sink 99, which extracts closed caption text for continuous display, closed caption splitter 98, from where it is passed to closed caption display 96 and AVI output file 97. The units 94 and 96 allow the video to be displayed along with its associated closed caption text. The output file 97 allows the user to edit and re-record portions of the stored text.

Figure 12 shows a typical display screen running in an active window 70 on visual display unit 28. Video segment 71 is playing along with its associated audio. Beside the video segment 71 is the closed caption text 72. Pointer 73 indicates the portion of text related to the current image 71. The pointer 73 can be dragged up and down with the mouse to cause the video corresponding to the indicated text to be played.

Figure 13 shows a window displaying a listing of recorded video clips. Double clicking on any of the items listed causes the item to appear in an active window along with the associated text for playback, which can be initiated using a Windows™ style control bar.

The system can be programmed to watch multiple channels simultaneously. In this case each channel has its own processing system as described with reference to Figure 9.

In the embodiment of Figure 14, block 700 contains a monitoring system as described above and outputs digital signals for distribution over a remote network. This is

achieved by feeding the signals through satellite gateway 703 to satellite antenna 704, which sends them via satellite 705 to any one of a series of clients, such as 706. The clients 706 are connected back to the block 700 via the internet 707 or the public switched telephone network 708. The client 706 can use a service known as DirecPC, which provides a wide bandwidth downlink, for example, to the internet, with the uplink being provided through a conventional modem.

Unit 702 receives broadcast signals 701, for example from air or over a cable. These can be conventional analogue signals, or alternatively they can be digital signals, for example in MPEG format. The unit 702 receives instructions from client 706 over the network. When a pattern match is achieved, it send the program signals over the network to the client 706.

The system described in Figure 14 effectively acts as a network, with the unit 700 being the network server.

In a further enhancement, the client 706 is connected back to a media server 709, which permits access to "on-demand" channels. A second monitoring system 710 can be provided, if desired, both units 706 and 710 being controllable by the clients 706.

The described system thus has the advantage that it offers instant alert to events as they occur. Television feed can be automatically organized as it is stored; i.e., closed caption text is synchronized with the incoming video and audio. This provides the ability to automatically create a multimedia database from which items can be retrieved based on content, such as spoken words, and the ability to retrieve video and audio segments with word or phrase resolution. A stored video feed can be retrieved based on new information

The synchronized video, audio and closed captions can be distributed over computer networks.

The invention also offers a much lower cost due to the elimination of manual intervention, and a reduction of raw information flow, resulting in less network congestion.

We claim:

1. A system for monitoring broadcast signals, comprising:
 - a) means for receiving the broadcast signals and generating program signals to make available programs carried by said broadcast signals;
 - b) user-operable selection means for inputting criteria identifying program content of interest to a user;
 - c) a database for storing data representing said criteria;
 - d) recognition means for generating from said broadcast signals a program data stream separate from said program signals and representative of program content;
 - e) a comparator for comparing said program data stream with said stored data; and
 - f) an output device operable to carry out a predetermined action when said program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.
2. A system as claimed in claim 1, wherein said recognition means decodes data signals embedded in said broadcast signals to produce said program data stream.
3. A system as claimed in claim 2, wherein said embedded data signals comprise a closed caption text stream.
4. A system as claimed in claim 1, wherein said recognition means comprise audio recognition means for analyzing audio content of the broadcast signals.
5. A system as claimed in claim 1, wherein said recognition means comprise pattern recognition means for analyzing video content of the broadcast signals.
6. A system as claimed in any of claims 1 to 3, further comprising a mass storage device for storing said program

signals in response to a match of said program data stream and said stored data.

7. A system as claimed in claim 6, wherein said program signals are stored with their associated program data on said mass storage device.
8. A system as claimed in claim 6, wherein said program signals are indexed according to said program data.
9. A system as claimed in claim 6, further comprising video and audio capture devices for generating respective video and audio signals providing said program signals.
10. A system as claimed in claim 6, further comprising means for tagging the stored program signals with the time of broadcast.
11. A system as claimed in claim 1, wherein said output device generates an alert signal to alert the user to the presence of program content matching the user's selection criteria.
12. A system as claimed in claim 11, wherein said alert signal activates a video monitor.
13. A system as claimed in claim 12, wherein said video monitor is a television set.
14. A system as claimed in claim 12, wherein said video monitor forms part of a multimedia computer environment.
15. A system as claimed in claim 14, wherein said multimedia computer environment also provides said user-operable selection means.
16. A system as claimed in claim 6, further comprising a short-term buffer for storing said program signals for a predetermined period to permit access to program content for a preselected time prior to detection of a program content match .

17. A system as claimed in claim 1, which is connected to a computer network to permit clients thereon to individually perform queries and receive program signals from the system according to their respective program criteria.
18. A system as claimed in claim 11, wherein said output device transmits said alert signal to a remote location for reception by the user.
19. A system as claimed in claim 18, wherein said alert signal is a beeper signal.
20. A system as claimed in claim 1, wherein said broadcast signals include a plurality of channels, said recognition means generate a plurality of data streams corresponding to said respective channels, and said comparator continually compares said program data contained in said plurality of program data streams with said stored data so as to monitor simultaneously said plurality of channels.
21. A system as claimed in claim 1, wherein said database stores a plurality of predefined user profiles representing preselected criteria for respective users, and means are provided to activate any one of said predefined user profiles.
22. A system as claimed in claim 1, wherein said broadcast signals are television signals, and said recognition means generates said program data stream from signals transmitted in the vertical blanking interval between successive television frames.
23. A system as claimed in claim 1, wherein said broadcast signals are radio signals.
24. A system as claimed in claim 1, which is located in a network server, said network server sending said program signals over the network to clients located thereon in

response to a match between said program data stream and said stored data.

25. A system as claimed in claim 24, which is located in a network server, wherein said network server forms part of a local area network.

26. A system as claimed in claim 24, wherein said network server is located remotely from said clients and a long-distance communications link is established between said network server and said clients.

27. A multimedia computer system, comprising:

- a) a central processing unit;
- b) a video capture unit for receiving broadcast television signals and generating a video signal therefrom;
- c) a video display unit capable of displaying said video signals under program control;
- d) means for decoding data signals embedded in said television signals and generating a program data stream representative of program content of said television signals;
- e) means for inputting criteria identifying program content of interest to a user;
- f) a database for storing data representing said criteria; and

said central processing unit being programmed to continually compare the program data with said stored data and carry out a predetermined action when said program data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

28. A multimedia computer system as claimed in claim 27, wherein said data signals are embedded in the vertical blanking interval of said television signals.

29. A multimedia computer system as claimed in claim 28, wherein data signals are closed caption signals.

30. A multimedia computer system as claimed in claim 29, wherein said stored data represent one or more keywords selected by the user.

31. A multimedia computer system as claimed in claim 30, wherein said stored data represent a plurality of keywords, and said output condition is generated when said plurality of keywords are detected in said program data stream within a preselected period in accordance with predefined Boolean logic.

32. A multimedia computer system as claimed in claim 27, wherein said central processing unit is programmed to store a segment of said video signals in response to a match of said program data and said stored data, said segment being stored with associated program data.

33. A multimedia computer system as claimed in claim 32, wherein said segment has a length preset by the user.

34. A multimedia computer system as claimed in claim 33, further comprising a buffer for temporarily storing said video signals prior to comparison of the associated program data with said stored data, said computer being programmed to store a segment of said video signals for a period starting from a preselected amount of time prior to detection of a match of said program data and said stored data and finishing a preselected amount of time after a match of said program data and said stored data.

35. A multimedia computer system as claimed in claim 34, wherein said central processing unit stores multiple said segments indexed according to said program data.

36. A multimedia computer system as claimed in claim 27, wherein said computer system has an operating system

employing multiple windows, and said video signals appear in one or more of said multiple windows under program control.

37. A multimedia computer system as claimed in claim 36, wherein said video signals appear in one or more of said multiple windows in response to a match of said program data and said stored data.

38. A multimedia computer system as claimed in claim 36, wherein said central processing unit is programmed to display a listing of stored segments in one of said windows in response to a user command.

39. A multimedia computer system as claimed in claim 36, wherein text information derived from said program data stream is displayed in one of said windows.

40. A multimedia computer system as claimed in claim 39, wherein said displayed text information is synchronized with associated an associated video display.

41. A multimedia computer system as claimed in claim 40, wherein said computer is programmed to indicate text related to a displayed image.

42. A multimedia computer system as claimed in claim 41, wherein said computer is programmed to display video corresponding to text information pointed to by the user so that when the user points to a string of text the computer displays the video image associated with the text.

43. A multimedia computer system as claimed in claim 27, which forms part of a network server, said network server distributing program signals to clients on the network in response to said output condition or a user request.

44. A multimedia computer system as claimed in claim 43, wherein said network is a local area network.

45. A multimedia computer system as claimed in claim 43, wherein said clients are connected to said network server over long-distance communications links.
46. A method of monitoring broadcast signals, comprising the steps of:
- a) extracting program signals from said broadcast signals;
 - b) generating from the broadcast signals a program data stream separate from said program signals and representative of program content;
 - c) comparing said program data stream with stored data identifying program content of interest to the user; and
 - d) generating an output condition when said generated program data stream matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.
47. A method as claimed in claim 46, wherein said program data signals are extracted from signals embedded in said broadcast signals.
48. A method as claimed in claim 46, wherein said broadcast signals are television signals and said data signals are embedded in the vertical blanking interval thereof.
49. A method as claimed in claim 48, wherein said embedded data signals are closed caption signals.
50. A method as claimed in claim 46, wherein said output condition generates an alarm signal to alert the user to the presence of matching data.
51. A method as claimed in claim 46, wherein said output condition activates a video monitor to permit the user to watch the program material.
52. A method as claimed in claim 46, wherein said output condition causes program material contained in said

broadcast signals to be stored so as to permit the user to watch the program material at a later time.

53. A method as claimed in claim 52, wherein said program material is stored with its associated program data.

54. A method as claimed in claim 53, wherein said video-monitor forms part of a multimedia computer system.

55. A method as claimed in claim 46, wherein said broadcast signals are received in digital format.

56. A method as claimed in claim 46, which takes place in a network server, and where said program signals are sent to clients on the network.

57. A method as claimed in claim 47, wherein said program signals are transmitted over a long-distance communications link to a remote said client in response to said output condition or a client request.

58. A computer-readable storage medium having binary information encoded thereon, said binary information being operable when interpreted by a computer to direct the computer to monitor broadcast signals and generate program signals to permit the presentation of program material carried by the broadcast signals to a user, analyze incoming broadcast signals to generate a program data stream separate from said program signals and representative of their program content, compare said data stream with stored data identifying program content of interest, and generate an output condition when said generated data matches said stored data to permit the user to examine a portion of a monitored program associated with said matching program data stream.

59. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to

generate said data stream from data signals embedded in said broadcast signals.

60. A computer-readable storage medium as claimed in claim 59, wherein said broadcast signals are television signals and said binary information directs the computer to generate said data stream from data signals embedded in the vertical blanking interval between successive frames.

61. A computer-readable storage medium as claimed in claim 60, wherein said embedded data signals are closed caption signals.

62. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to generate an alarm signal to alert the user when said output condition occurs.

63. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to activate a video monitor to permit the user to watch program material carried by said broadcast signals when said output condition occurs.

64. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to cause program material contained in said broadcast signals to be stored in a computer file so as to permit the user to review the program material at a later time.

65. A computer-readable storage medium as claimed in claim 58, wherein said binary information directs the computer to store said program material in a computer file with its associated program data.

66. A computer-readable storage medium as claimed in claim 58, wherein said video monitor forms part of a multimedia computer system.

67. A computer-readable storage medium as claimed in claim 58, wherein said computer runs under an operating system employing multiple windows and said binary information directs the computer to display program material carried by said broadcast signals in a said window in accordance with user instructions.

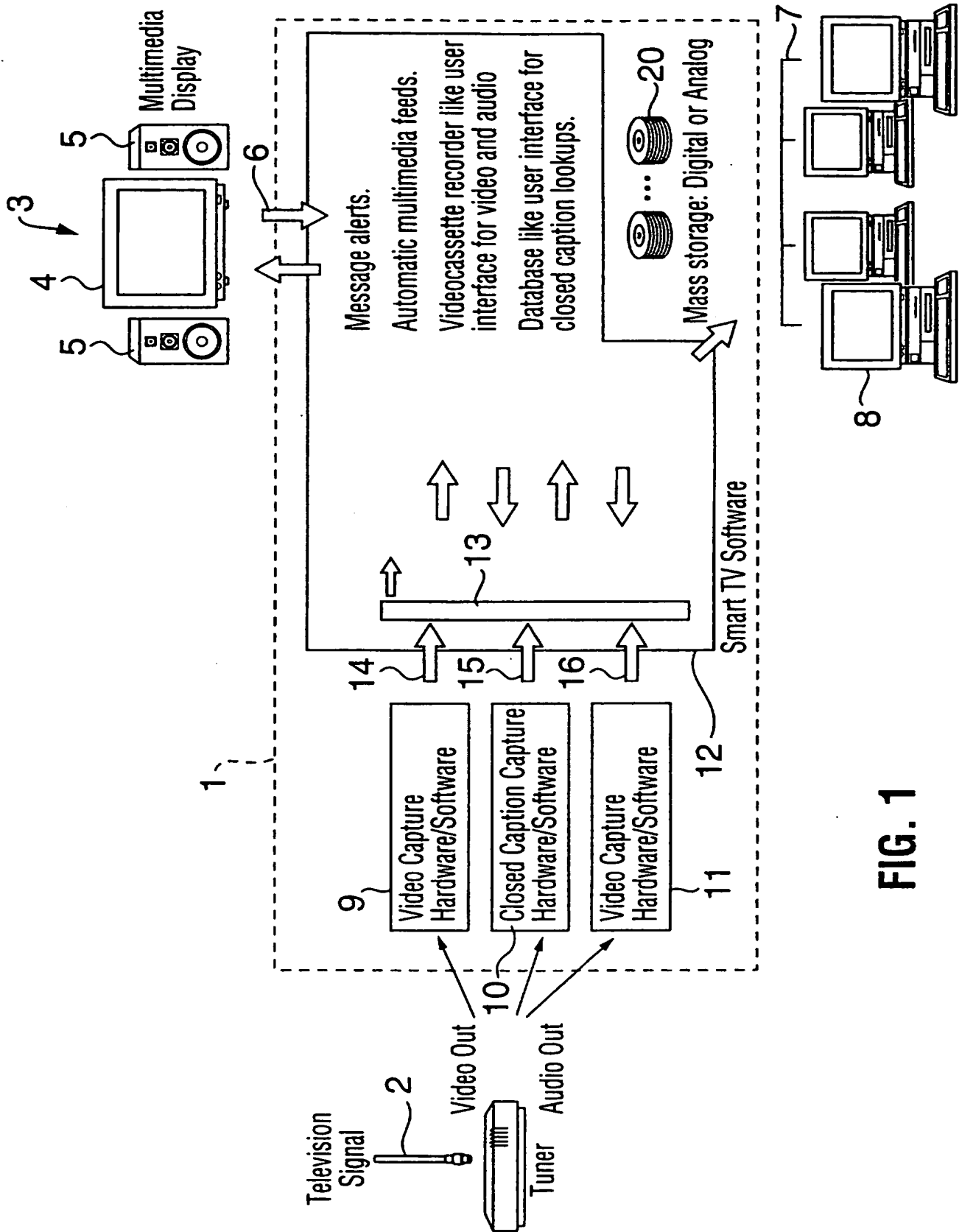
68. A computer-readable storage medium as claimed in claim 67, wherein said binary information directs the computer to display program material carried by said broadcast signals in a said window in response to said output condition and in accordance with user instructions.

69. A computer-readable storage medium as claimed in claim 68, wherein said binary information directs the computer to display said program material in a said window in association with related text material generated from said program data stream.

70. A computer-readable storage medium as claimed in claim 67, wherein said binary information directs the computer to permit the user to view any portion of said program material by pointing to the associated text material in a said window.

71. A computer-readable storage medium as claimed in claim 58, wherein said computer is a network server.

1/13



2/13

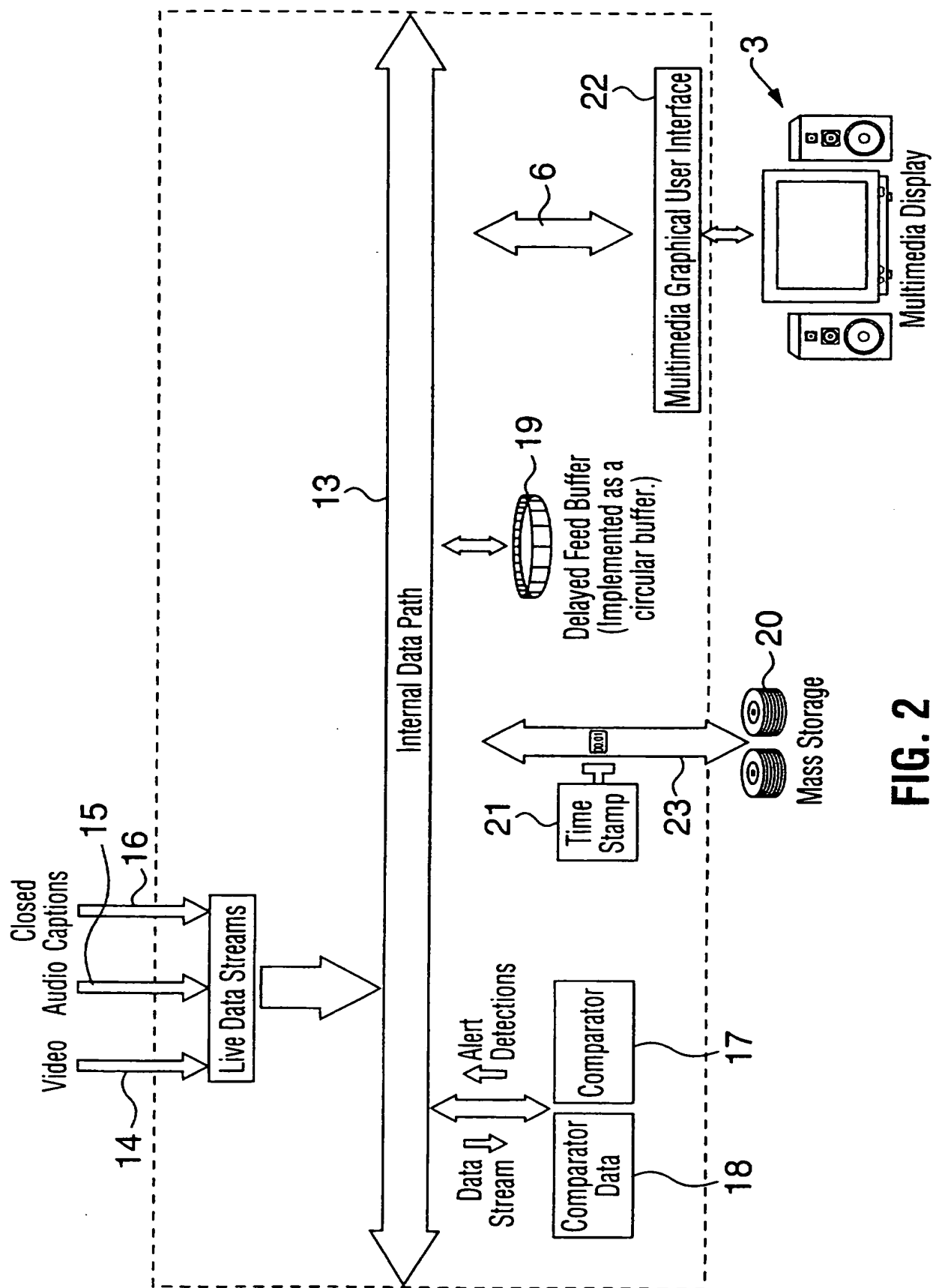


FIG. 2

3/13

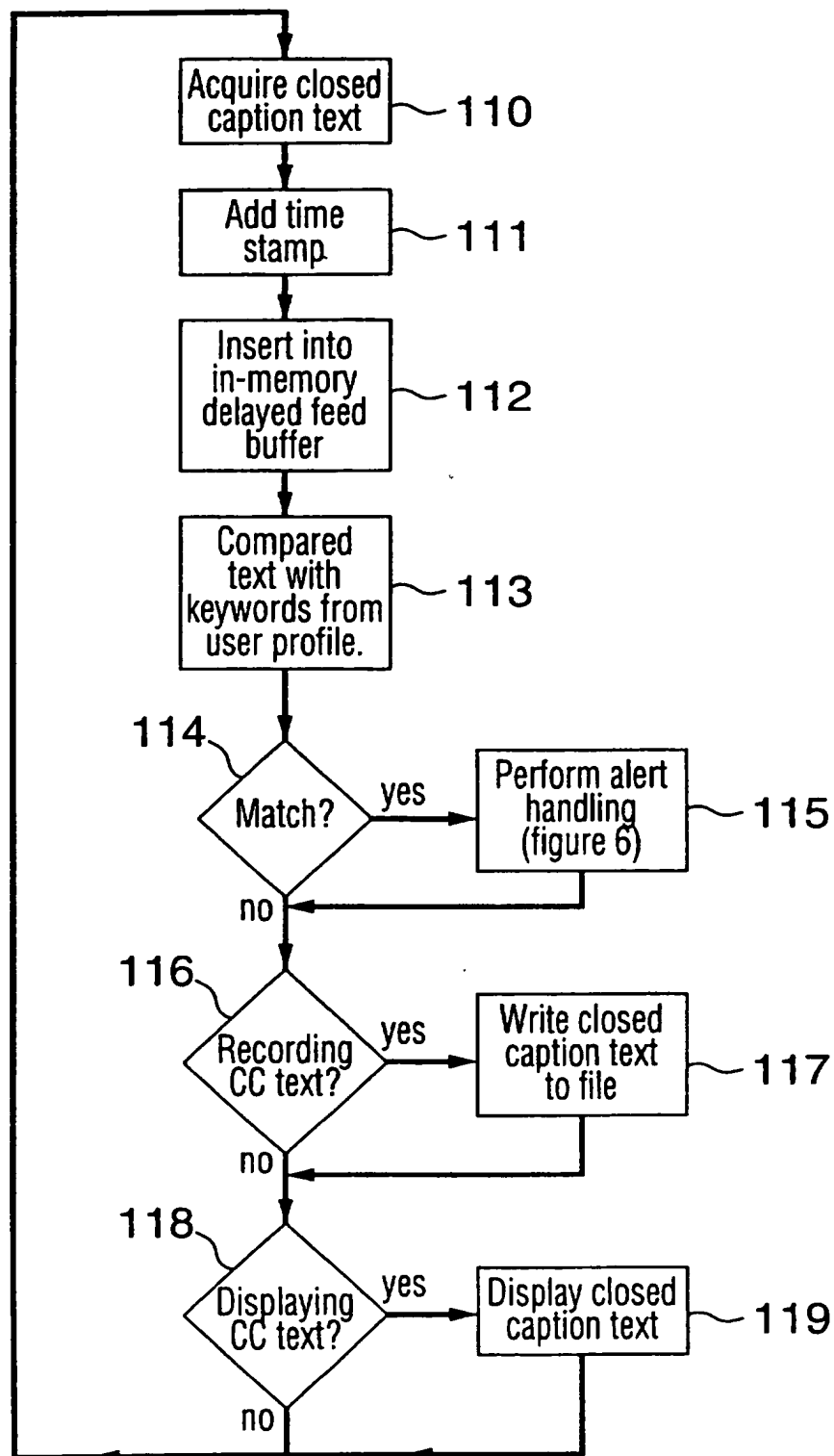


FIG. 3

4/13

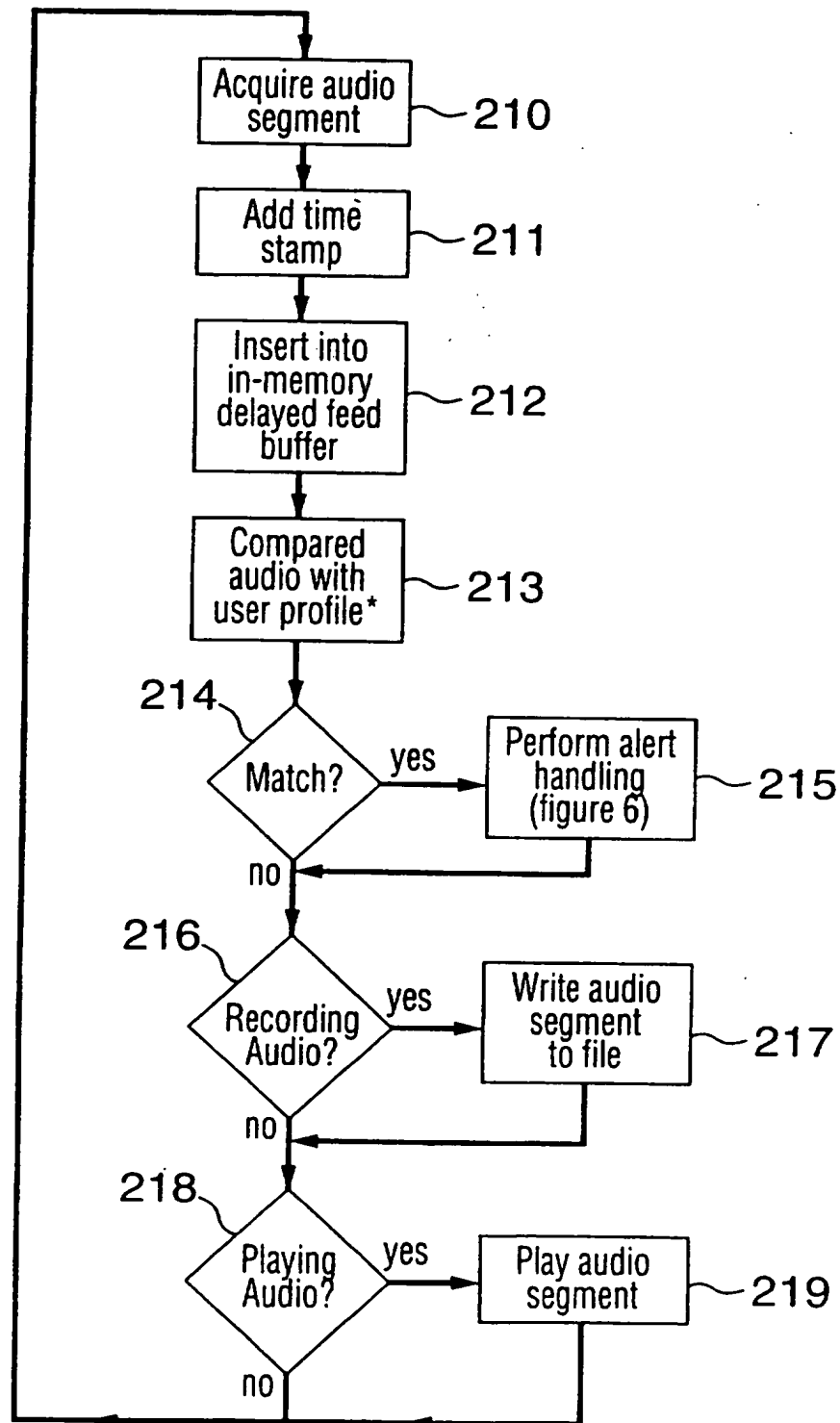


FIG. 4

5/13

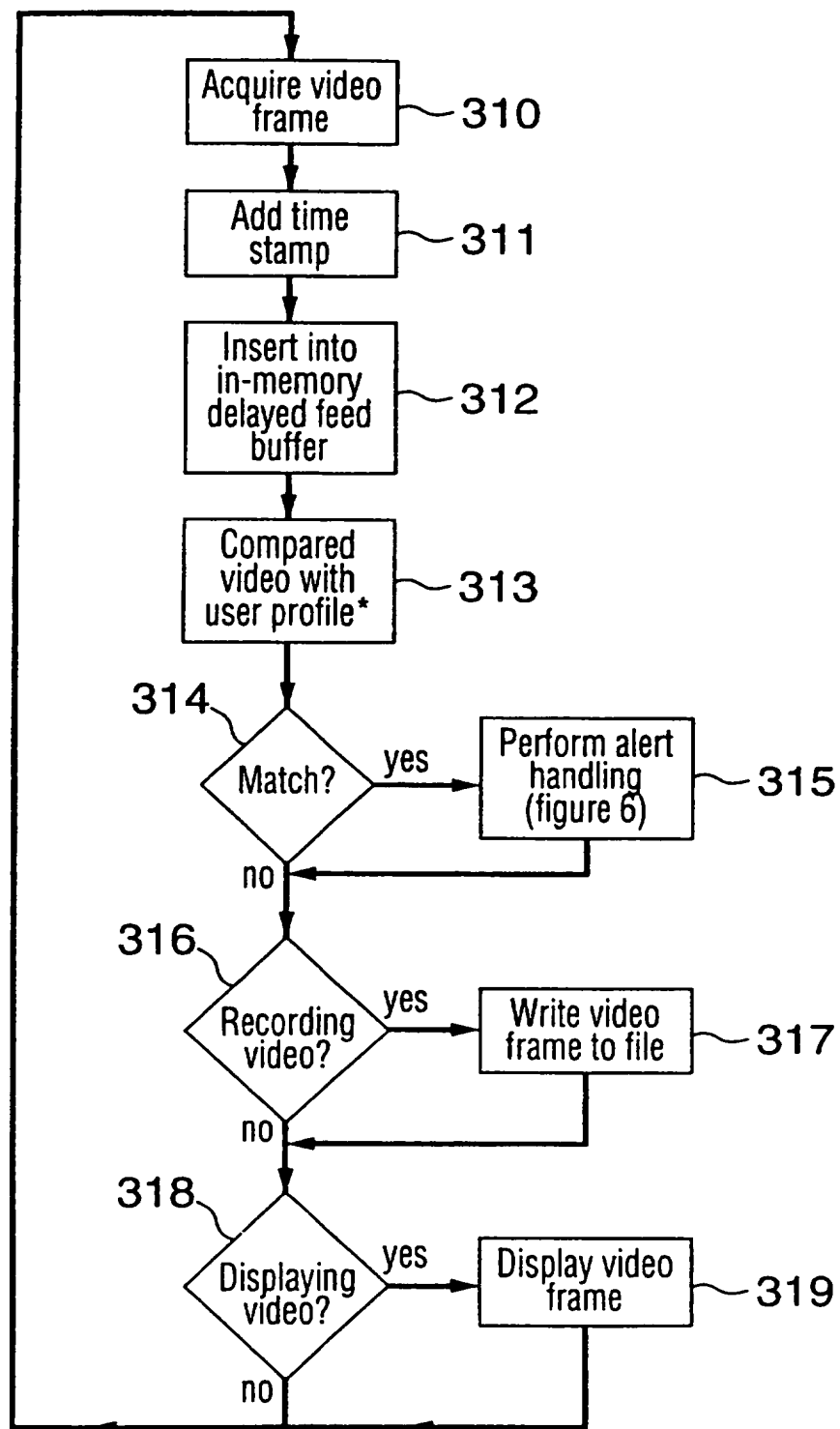


FIG. 5

6/13

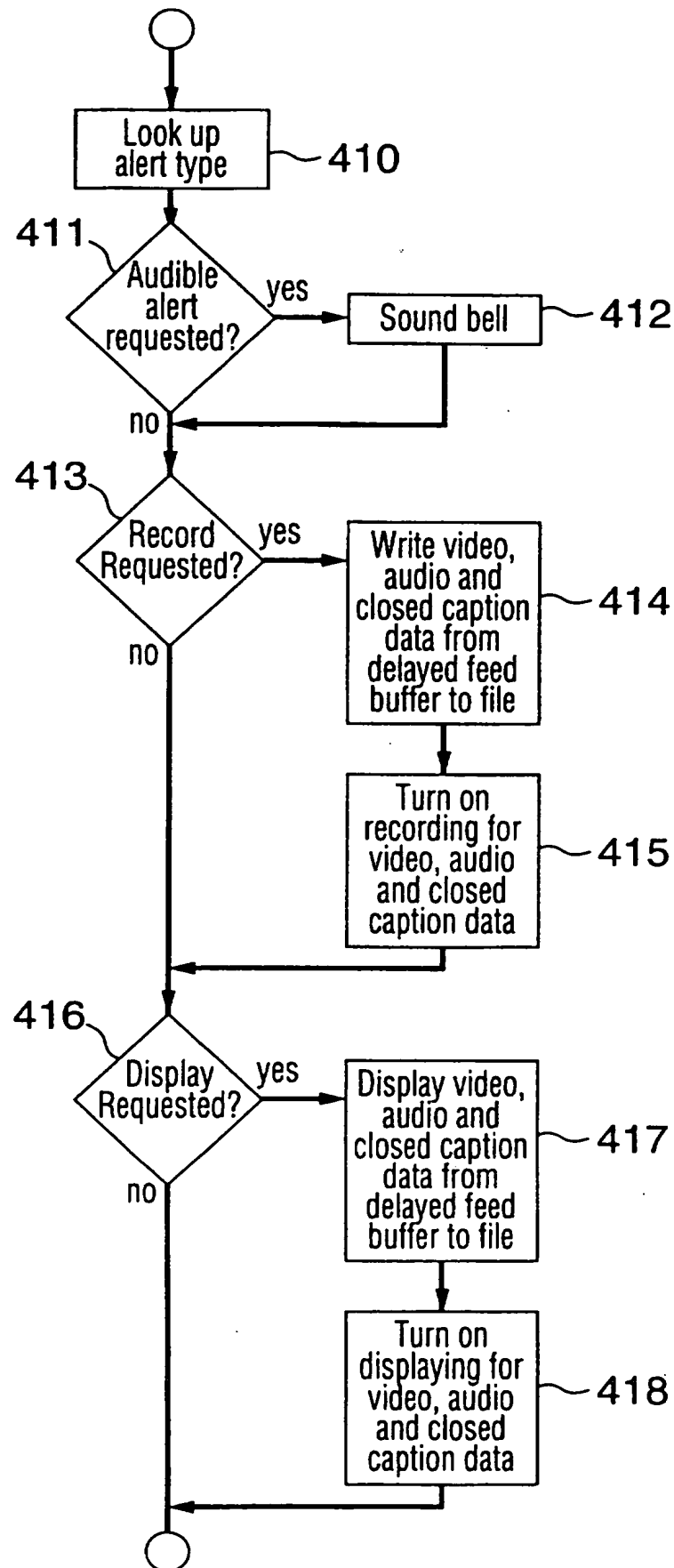


FIG. 6

7/13

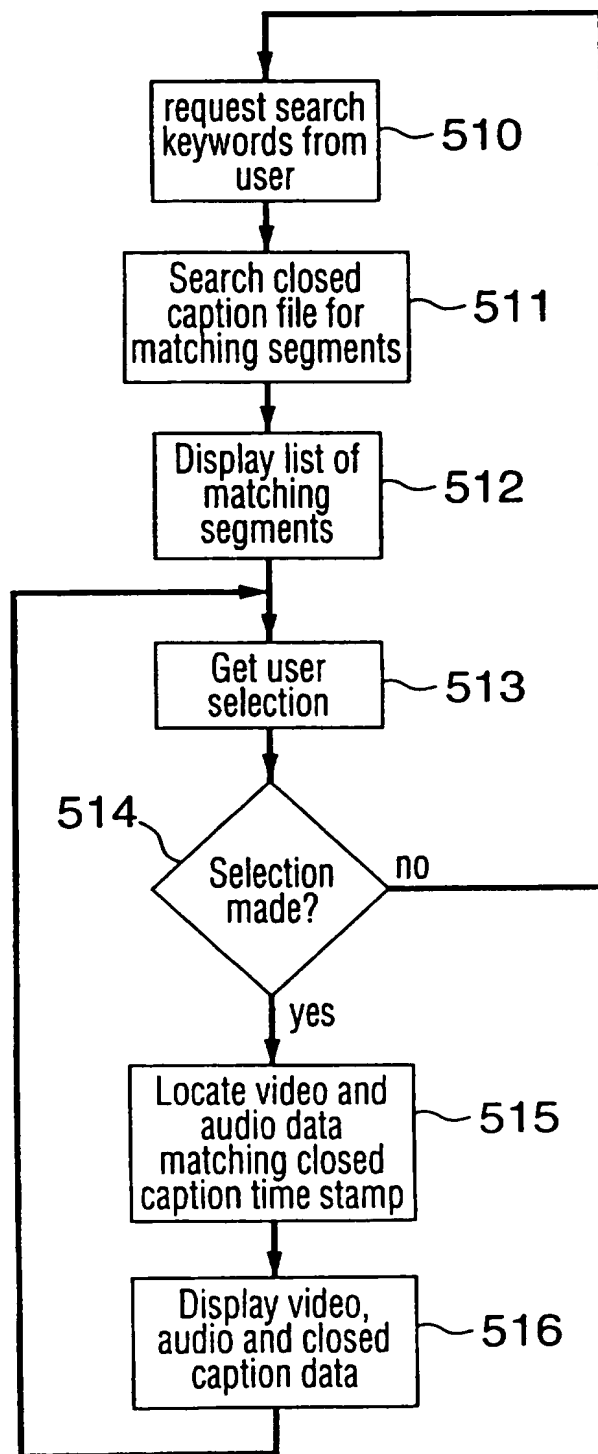


FIG. 7

8/13

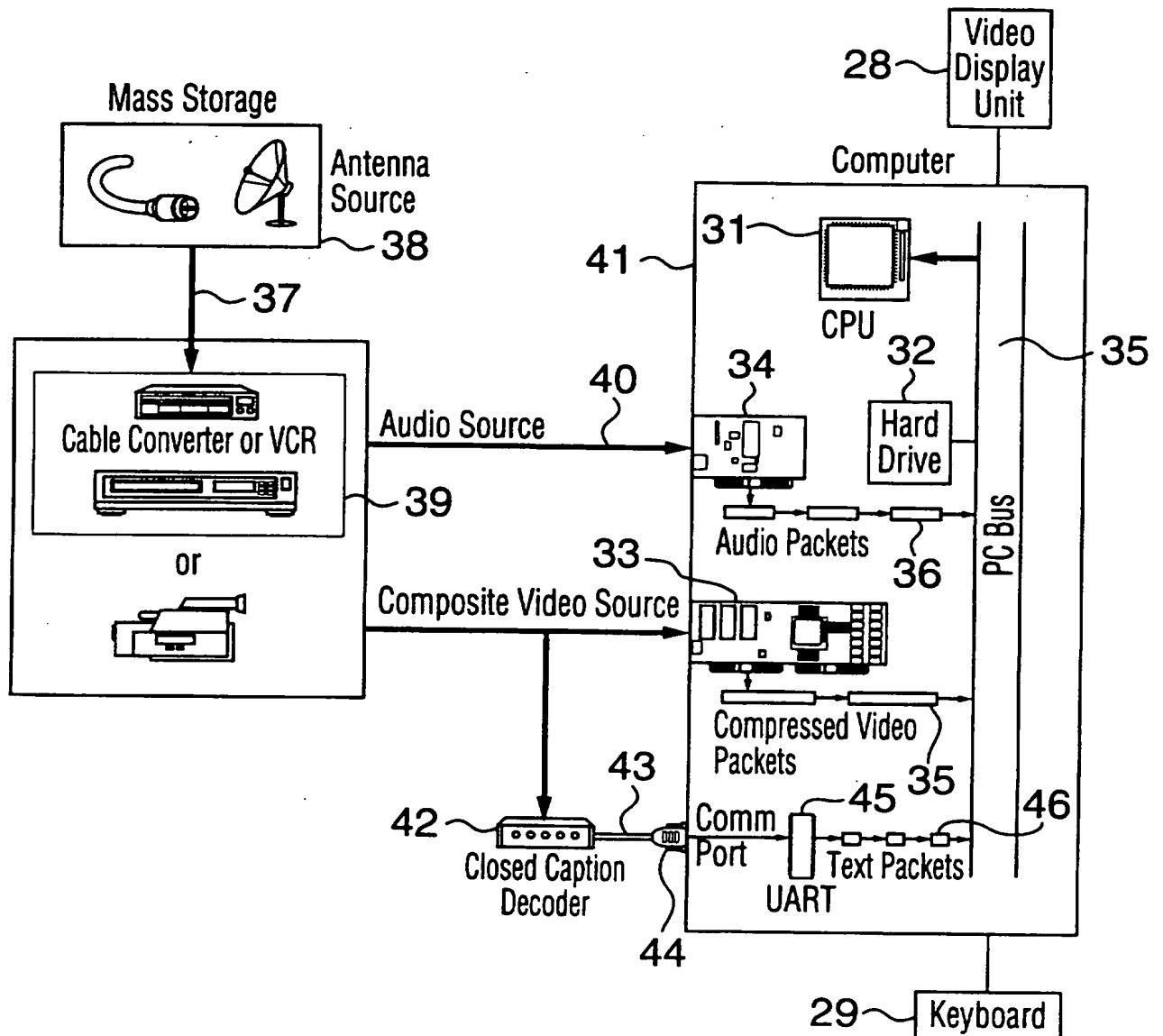
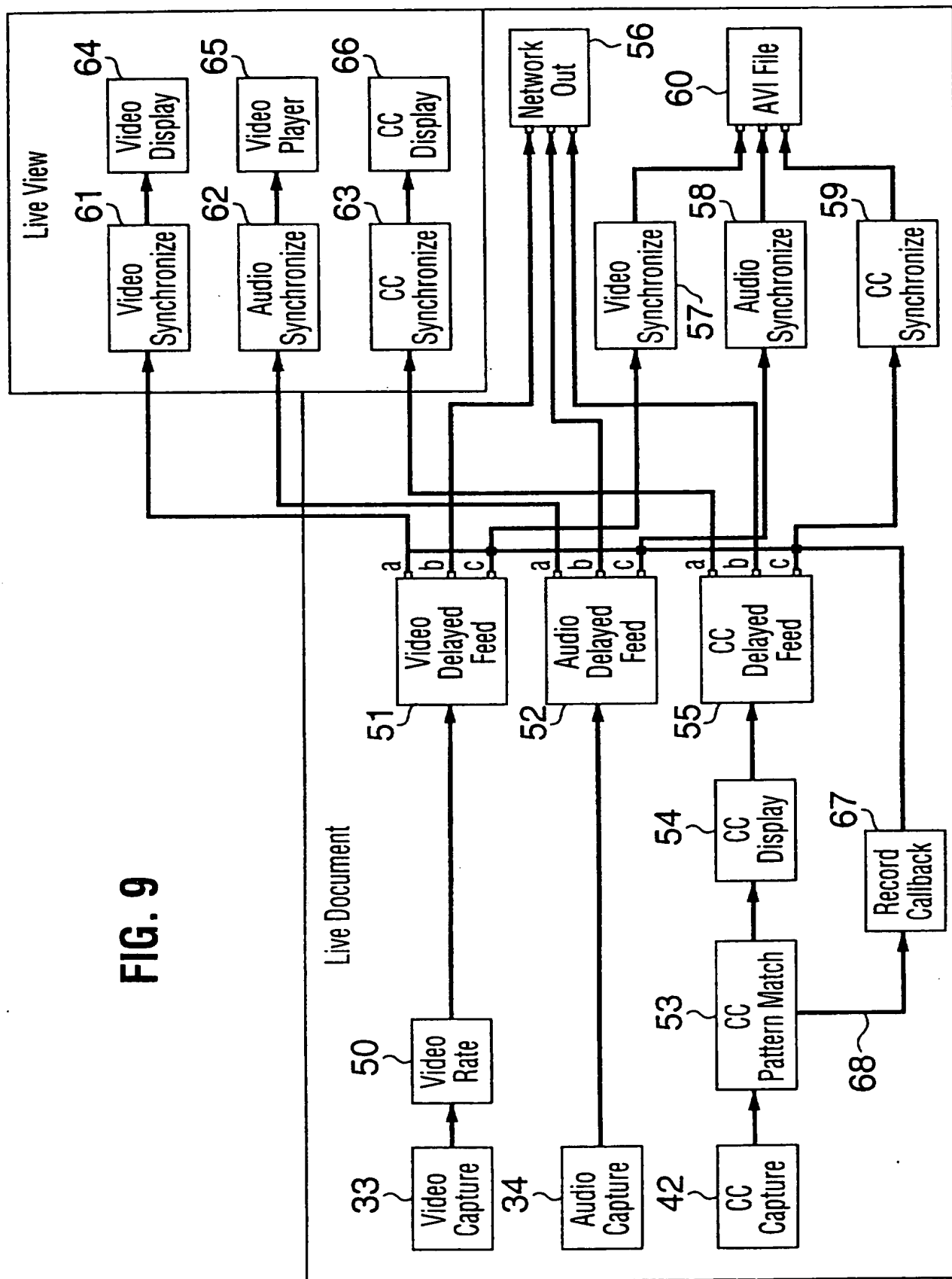
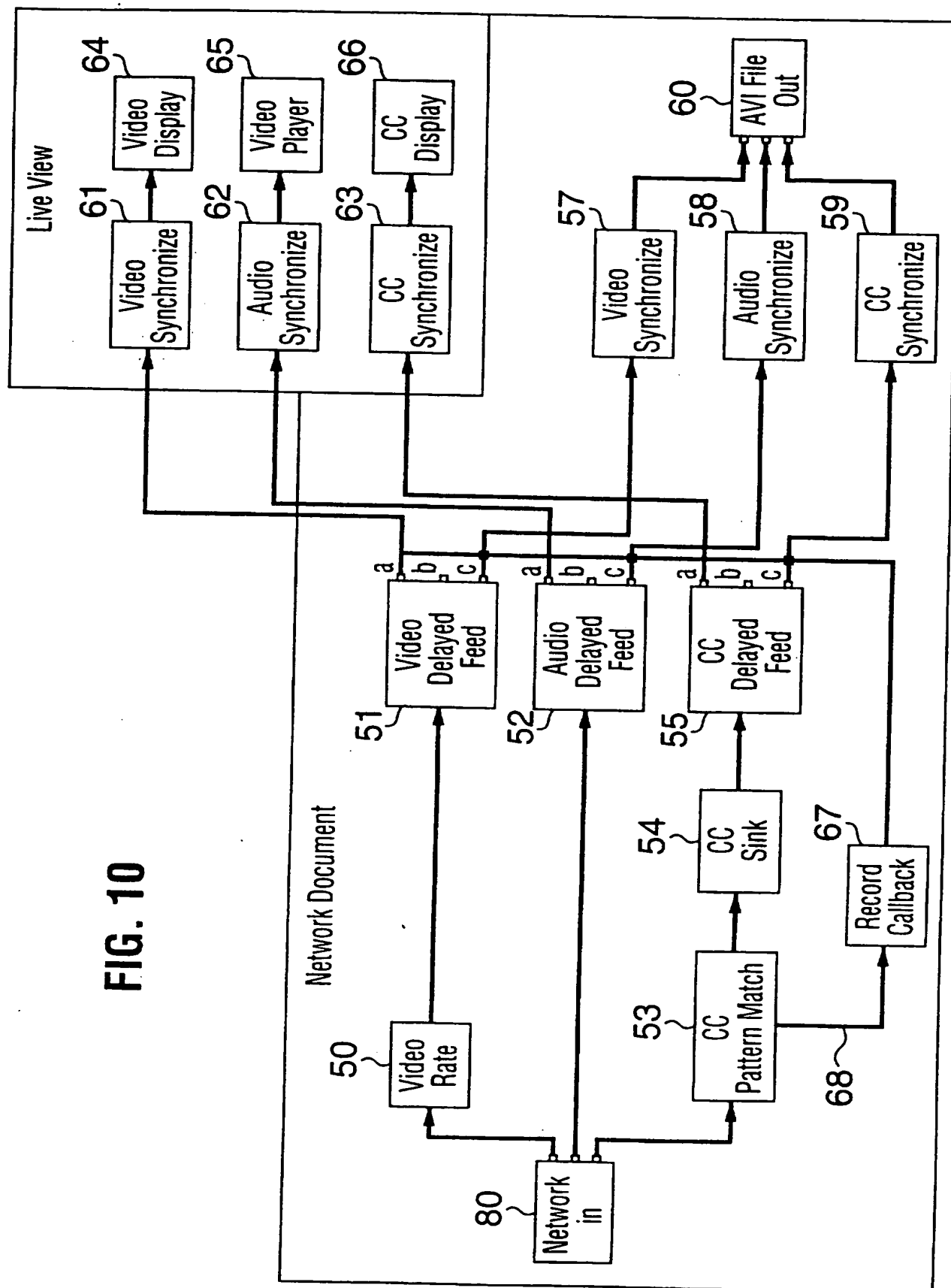


FIG. 8

9/13



10/13



11/13

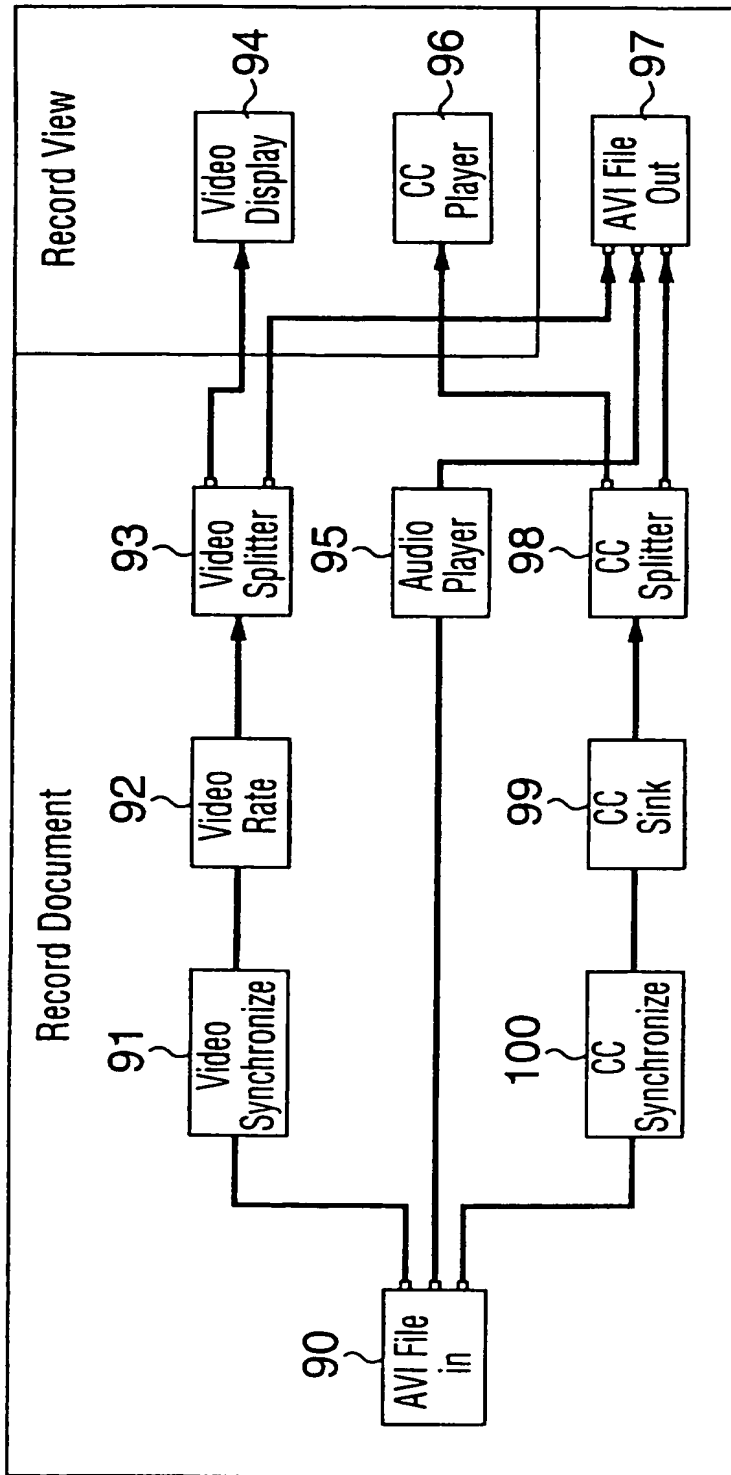


FIG. 11

12/13

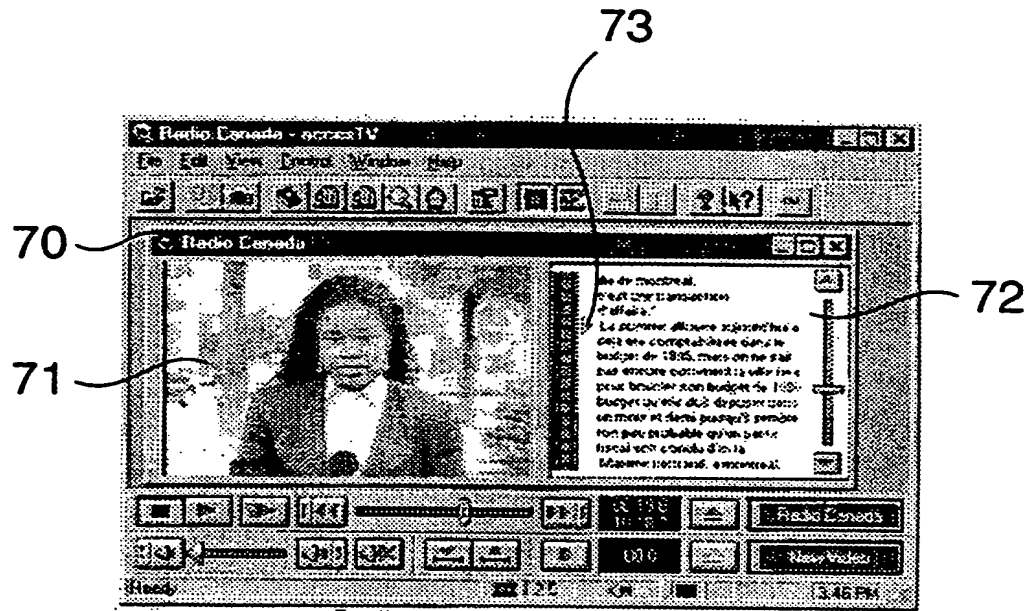


FIG. 12

Contents of Player (New Video)

Name	Description	Date	Start	Length	Source
World Business	Int'l business news	Nov 12 95...	00:00:00	00:00:30	CBC - SRC
World Business (2)	Int'l business news	Nov 12 95...	00:00:30	00:01:22	CBC - SRC
News Brief	Daily News updates	Nov 12 95...	00:00:60	00:04:59	CBC - SRC
World Business (3)	Int'l business news	Nov 12 95...	00:01:53	00:00:30	CBC - SRC
World Business (4)	Int'l business news	Nov 12 95...	00:03:04	00:01:21	CBC - SRC
User Clip	You Pressed Record	Nov 12 95...	00:06:09	00:01:04	CBC - SRC
User Clip (2)	You Pressed Record	Nov 12 95...	00:07:14	00:00:31	CBC - SRC

FIG. 13

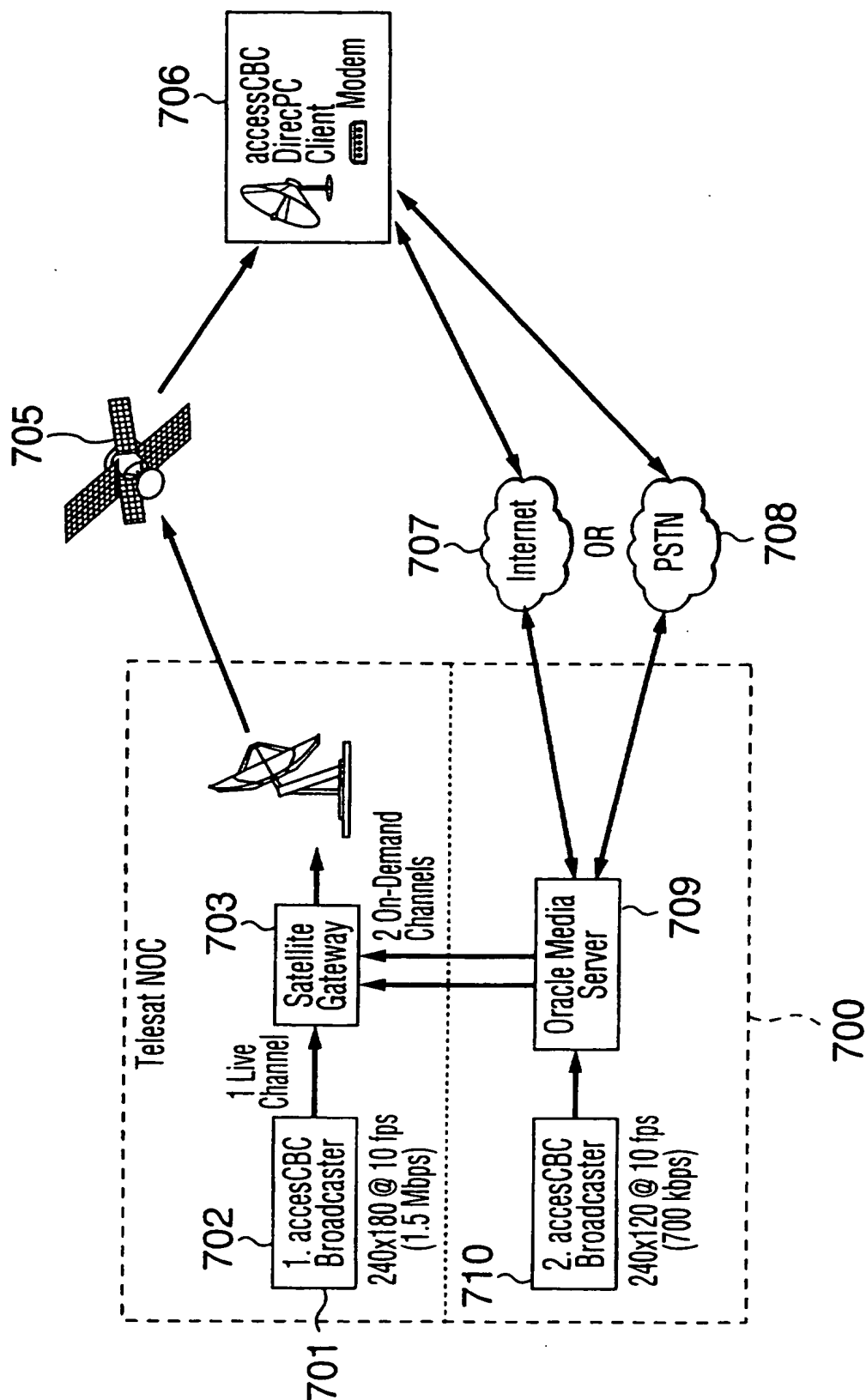


FIG. 14

INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/CA 96/00131

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F17/30 G06F11/32 H04H9/00 H04N7/088 G06F17/60
G11B27/034

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04H H04N G06F G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,4 857 999 (WELSH) 15 August 1989 see abstract see column 7, line 39 - column 8, line 58 see column 11, line 19 - line 34 ---	1-72
Y	US,A,5 253 061 (TAKAHAMA ET AL.) 12 October 1993 see abstract see column 4, line 3 - column 5, line 15 ---	1-72
A	US,A,5 343 251 (NAFEH) 30 August 1994 see abstract see column 7, line 13 - line 57 ---	11,12
A	US,A,5 210 611 (YEE ET AL.) 11 May 1993 see abstract ---	1
	--- -/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

8 May 1996

Date of mailing of the international search report

07.06.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+ 31-70) 340-3016

Authorized officer

Absalom, R

INTERNATIONAL SEARCH REPORT

Inte mal Application No

PC1/CA 96/00131

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	COMMUNICATIONS OF THE ACM, vol. 35, no. 12, December 1992, USA, pages 39-48, XP000334363 S. LOEB: "Architecting Personalized Delivery of Multimedia Information" see the whole document ---	16
A	INTERNETWORKING, RESEARCH AND EXPERIENCE, vol. 5, no. 4, December 1994, UK, pages 151-162, XP002002475 J.C. PASQUALE: "The Multimedia Multicast Channel" see the whole document ---	24
A	US,A,4 845 658 (GIFFORD) 4 July 1989 see the whole document ---	24
A	EP,A,0 248 533 (SCANAMERICA L.P.) 9 December 1987 see figures 2,3,8-11 ---	1
Y	US,A,5 192 999 (GRACZYK ET AL.) 9 March 1993 see abstract see column 1, line 37 - line 47 see column 5, line 3 - line 14 ---	27-45
A	US,A,4 230 990 (LERT, JR. ET AL.) 28 October 1980 see column 9, line 63 - column 10, line 9 -----	4,5,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC1/CA 96/00131

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4857999	15-08-89	CA-A- 1337363	17-10-95
US-A-5253061	12-10-93	JP-A- 4021286	24-01-92
US-A-5343251	30-08-94	WO-A- 9427404	24-11-94
US-A-5210611	11-05-93	WO-A- 9417629	04-08-94
		EP-A- 0681775	15-11-95
US-A-4845658	04-07-89	NONE	
EP-A-248533	09-12-87	US-A- 4739398	19-04-88
		AU-B- 585809	22-06-89
		AU-B- 7243787	12-11-87
		CA-A- 1323415	19-10-93
		DE-D- 3750437	06-10-94
		DE-T- 3750437	06-04-95
		JP-C- 1867925	26-08-94
		JP-A- 63024786	02-02-88
		JP-A- 6006833	14-01-94
		JP-A- 6006834	14-01-94
US-A-5192999	09-03-93	NONE	
US-A-4230990	28-10-80	NONE	